

that two colonies may attach themselves to each other to form a larger confederation, after what has been said as to the facility with which the members of the same chapel married and divorced each other.

Here the observations close.

Is the mode of reproduction (fissiparity) which I have just described the only one possessed by this species? This is a question which I cannot venture to decide; we must not hypothecate the future; and if it is true that we do not know any other mode of propagation than the above in certain genera (*Protamæba*, *Myxodictyum*), it is not less true that our ignorance in this respect may merely be the consequence of adverse circumstances. We may, however, note that in the Monera which encyst themselves for the purpose of propagation (*Vampyrella*, *Protomyxa*, &c.) we rarely find that the species is also endowed with active fissiparity during the period of its free existence; and this consideration may lead us to assume that we have to do here with a simple organism having only the simplest and most rudimentary of all the modes of multiplication, division without any preliminaries in the free state.

After what has just been stated it can hardly be doubted that our *Monobia confluens* is a Moneron. Is it possible that we have to do with an evolutive phase of a higher organism? I see no reason to suppose any thing of the kind; and analogy is opposed to such a suspicion.

Like *Myxodictyum sociale*, this Moneron might be regarded, after the example of Claus, as a naked Foraminifer, if we did not know that the latest investigations on the Foraminifera tend to demonstrate the general existence of a nucleus in the representatives of that group. It therefore seems to me necessary to retain the order Monera as Hæckel established it, until our knowledge of the mutual relations of the Protozoa shall become more complete.

#### BIBLIOGRAPHICAL NOTICES.

*On the Structure and Affinities of the "Tabulate Corals" of the Palæozoic Period, with Critical Descriptions of Illustrative Species.*  
By H. ALLEYNE NICHOLSON, M.D., D.Sc., F.L.S., &c. W. Blackwood & Sons: Edinburgh & London, 1879.

THIS work is a further contribution towards the history of the Tabulate Corals, and contains a record of researches carried on during some years past on the Palæozoic species. The study of the forms

belonging to this group has become of considerable interest and importance, both as regards their general structure and zoological position. As to their affinities, considerable difference of opinion prevails on some important points. Formerly regarded as true Zoantharia, it now appears doubtful, from recent investigations, whether most of the forms so assigned belong to that group. In fact, says Mr. H. N. Moseley (1876), "it would be as well if the term Tabulata were dropped altogether, since it has reference to a structure common to certain Alcyonaria, Zoantharia, and Hydroida, and, being not characteristic of any natural group, only tends to confusion."

Twenty years ago (1859) Agassiz suggested the hydroid nature of *Millepora*, which view, adopted by Claus and others in Germany, and by Dana in America, was only partially accepted. M.-Edwards, in the following year (1860), did not consider the facts on which this opinion was formed sufficiently ascertained; and Prof. Allman has recently expressed some uncertainty on the subject. With the exception of Prof. Verrill (Ann. & Mag. Nat. Hist. 1872, vol. ix. p. 355), no one had examined the soft parts of any of the Tabulata, until the critical investigations of Mr. Moseley were communicated to the Royal Society in 1876, in which he states, "though no evidence as to the structure of the generative system of *Millepora* was obtained, the results yield convincing proofs that this interesting form is a true Hydroid;" and the subsequent still more elaborate paper on the Stylasteridæ (the Croonian Lecture, 1878) has further elucidated the subject, by showing that this family, with the Milleporidæ, should form a suborder, the Hydrocorallina.

Besides the Milleporidæ, Agassiz believed that the Favositidæ, and all the other species of which the septa are not continued vertically, ought not to be classed with the Corals—an opinion combated by Verrill and doubted by M.-Edwards; while M. Dollfus classed some genera of the Tabulata with the Hydroida, and the Chætetidæ and Favositidæ, he considered, were allied to certain forms of Polyzoa.

Prof. M. Duncan, in 1871 (Rep. Brit. Assoc.), treated of the structure and affinities of the Tabulata, still retaining them among the Zoantharia, classing them into two principal and five minor groups, but considering some genera, as *Chætetes* and similar forms, to be allied to the Alcyonaria.

The object of Dr. Nicholson in the work under notice is an attempt to elucidate the minute anatomy of the principal Palæozoic genera, which he has personally investigated; and this has been chiefly effected by means of microscopic sections; so that the present work is more extensively occupied with detailed descriptions of minute structure than treatises on fossil corals usually are; and well-known types have generally been selected for study.

The first chapter is devoted to the affinities and classification of the Tabulate corals, and also contains a concise historical sketch, showing the principal tendencies of the more recent researches of naturalists and palæontologists with regard to this group of corals. The investigations of the author lead him to corroborate the views

of Verrill, Lindström, and Moseley (above noticed) as to the necessity of abolishing the "Tabulata" as a distinct and separate division of the Zoantharia; and, further, that under the old name of Tabulata there are included twelve distinct groups of Corals: some of these are Hydrozoa and Zoantharia; a large number may be referred to the Aleyonaria; but none are, probably, referable to the Polyzoa.

The twelve groups into which Dr. Nicholson proposes to divide the Tabulata are the following—Milleporidæ, Pocilloporidæ, Favositidæ, Columnariadæ, Syringoporidæ, Auloporidæ, Halysitidæ, Tetradiidæ, Thecidæ, Helioporidæ, Chætetidæ, and Labechidæ.

The first two groups, not containing any Palæozoic representatives, are but briefly noticed; the far larger portion of the work (chaps. 2 to 14) comprises the results of the author's investigations of the remaining ten groups. In chapters 2 to 6 (pp. 30-186) the author enters fully into the characters, position, and affinities of the older genera considered by him to belong to the Favositidæ, and concludes, after an extended study of their minute structure, that Prof. Verrill and Dr. Lindström are right in referring all the corals usually included under this head to the *Z. perforata*; and while not prepared to regard the group as a *subfamily* according to the views of the above authorities, Dr. Nicholson gives his reasons at some length for inferring that "a large number of the types are more or less allied to the Poritidæ, and some of which may perhaps be capable of final removal to the latter family, but which really represent a series of separate though allied groups."

Under the Columnariadæ are provisionally placed a few Palæozoic corals; but their precise position is uncertain, as the typical forms exhibit certain Rugose features, while, on the other hand, they present some conspicuous points of resemblance to the Astræidæ.

With regard to the Palæozoic family Syringoporidæ, Dr. Nicholson does not agree with the opinion of Dana and others as to *Syringopora* being allied to *Tubipora*, nor with Lindström that it is a Rugose coral, but considers that this family is related to the Favositidæ, and should therefore find a place among the *Z. perforata*.

The family Auloporidæ is considered to be in a chaotic condition, so that it is impossible to come to any positive conclusion as to its affinities or the forms it may contain, the materials in the author's possession being insufficient for its clear elucidation; but it may probably be regarded as a peculiar group of the Aleyonaria.

The Halysitidæ, typified by the so-called "chain-coral," are separated from the Syringoporidæ, which were included with them by M.-Edwards and Haime, and are stated to be nearly allied to the Helioporidæ, which they resemble in the general possession of two sets of tubes, differing in size and in the position of their tabulæ.

The singular Silurian genus *Tetradium*, Dana, forms the family Tetradiidæ; in general appearance it resembles some forms of *Chætetes*, as *C. radians*, and in some characters is allied to *Haly-*

sites and *Heliolites*; but from the quadripartite character of the septa, Prof. Safford regarded the genus as referable to the Rugosa.

The group Thecidæ includes but one genus, *Thecia*, restricted to the Silurian rocks, the typical species of which, *T. Swinderniana*, Goldf., the author has submitted to a careful macroscopic and microscopic investigation, from which it seems to form, in some respects, a link between the Perforate Corals and the Alcyonarian family of the Helioporidæ. For the structure and relations of the Helioporidæ we are indebted to the researches of Mr. Moseley (Phil. Trans. vol. clxvi. pt. 1, p. 91), which prove that *Heliopora* and its ancient allies are truly Alcyonarians. Most of the genera are Palæozoic; one (*Polytremacis*) is Secondary; and *Heliopora* is both Cretaceous and Recent.

The next group, the Chætetidæ, Dr. Nicholson considers to be made up of very heterogeneous materials, which must ultimately be disintegrated. The chief member (*Chætetes radians*) and its allies are in some respects similar to the Favositidæ, "except that 'mural pores' in the walls are wanting, while there are (in reality) no traces of septa, and the walls of the corallites are completely amalgamated." Although these forms are far removed from the Favositidæ, he is satisfied that they are genuine Actinozoa, and seem to have more affinities with the Alcyonaria.

The group Monticuliporidæ, founded on the genus *Monticulipora*, D'Orb., and originally considered to be a Bryozoan, includes numerous forms whose position is uncertain, and which "constitute perhaps the most difficult and intricate assemblage of Palæozoic fossils with which the zoophytologist is called to deal" (p. 270).

Although giving the results of his investigations in considerable detail (pp. 270-330) as to the internal structure of the corals usually referred to *Monticulipora* and allied types, Dr. Nicholson proposes to publish hereafter an entirely separate memoir on the group. He considers, however, that although strong evidence has been brought forward to prove these forms to be Polyzoa, yet, from their general structural character and resemblance to Cœlenterate types, the majority will prove to belong to the Actinozoa.

The last family, Labechidæ, comprises the anomalous genus *Labechia*, originally placed by M.-Edwards and Haime among the Chætetidæ, and considered by Dr. Lindström truly a Hydrozoon allied to *Hydractinia*. The peculiarities in its structure, however, are so numerous, and the apparent total absence of superficial openings of any kind is so puzzling, that Dr. Nicholson does not at present see how it can be placed among either the Hydrozoa or the Actinozoa.

We have attempted but a brief and imperfect sketch of the chief views of Dr. Nicholson on the twelve subdivisions of the Tabulata, which the reader will find given in detail in the separate chapters treating of each special group.

That some of the conclusions arrived at will be generally accepted the author does not expect; but while acknowledging the assistance he has derived from the labours of previous observers, it is fair to state that most of the facts recorded in the volume have been veri-

fied by himself, and that nearly all the illustrations, whether in the text or in the plates, are from original drawings of sections prepared by him, with the view of showing the minute structure of the principal Palæozoic genera of the Tabulata, thus rendering the work a useful addition to this branch of Palæontology.

*Geological Survey of Canada. Mesozoic Fossils. Vol. i. part ii. On the Fossils of the Cretaceous Rocks of Vancouver and adjacent Islands in the Strait of Georgia.* By J. F. WHITEAVES, F.G.S. Montreal, 1879.

THIS work forms the second decade of the first volume of Mesozoic fossils, published by the Geological Survey of Canada, and contains a description by Mr. Whiteaves of the fossils collected by Mr. Richardson from the Cretaceous rocks of Vancouver Island and adjacent districts, an account of which strata appeared in the 'Progress Report' of the above survey for the years 1871-76. The coal-bearing strata from which the fossils were obtained occupy a narrow strip on the shores of the Georgian Strait, and their continuity is broken by crystalline rocks so as to divide them into two areas, respectively termed the Comox and the Nanaimo coal-fields.

About one hundred species are noticed, chiefly from the productive coal-measures. These, with one exception, a *Smilotrochus*, belong to the Mollusca: more than half the species are Lamellibranchs; and the Gasteropoda are more abundantly represented than the Cephalopoda.

The geology of Vancouver Island was noticed many years since (1861) by Dr. Hector; and some of the fossils have been described during the last twenty years by Mr. Meek, Mr. Gabb, and Dr. Shumard; but seventeen are new to science. In order, however, to present as complete a report as possible on the fossil fauna of these deposits, Mr. Whiteaves has added in their proper places the names of species described or recorded from them by other naturalists.

Thirty species from the coal-bearing rocks of Vancouver are also found in the Chico group of California, which, with the Martinez group, probably represent the Lower and Upper Chalk of Europe, while on palæontological and stratigraphical grounds (says Mr. Whiteaves) it seems likely that the coal-formation of the Nanaimo, Cowitchin, and Comox districts is the equivalent in time of the whole of the Upper Cretaceous. Some of the fossils of the Vancouver Cretaceous appear to have an extensive geographical range, as about fourteen species are believed to be common to the coal-bearing rocks of the Nanaimo and Comox districts and to the Chalk formation of Europe, Asia, or Africa. Among other interesting facts alluded to in the Report is that of the former extent of the Cretaceous ocean in North America, which, according to some authors, was separated into two basins by a land barrier nearly coincident with the present main axis of the Rocky Mountains. This hypothesis is now considered untenable, both on physical and palæontological grounds; and the results of recent explorations confirm the opinion of Mr. Gabb, that there must have been a water communication between